Special Articles and Association Notes

The Manitoba Medical Association Review

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Minutes of Executive Meeting

Minutes of a meeting of the Executive Committee of the Manitoba Medical Association held in the Medical Arts Club on Monday, June 12th, 1939, at 6.30 p.m.

Present.

Officers and members of Executive Committee:

Dr. W. S. Peters, Chairman, Dr. W. W. Musgrove, Dr. W. G. Campbell, Dr. O. J. Day, Dr. C. B. Stewart, Dr. E. W. Stewart, Dr. W. F. O'Neill, Dr. E. L. Ross, Dr. Geo. Brock, Dr. W. E. Campbell, Dr. S. G. Herbert, Dr. O. C. Trainor, Dr. C. W. MacCharles.

Representatives on Council of Canadian Medical Association:

Dr. T. E. Holland, Dr. J. D. Adamson, Dr. Ross Mitchell.

Chairman of Committee on Constitution and By-Laws:

Dr. F. D. McKenty.

Chairman of Committee on Sociology:

Dr. E. S. Moorhead.

Reading of Minutes of Executive Meeting, May 23rd, 1939.

Copies of a summary of the minutes had been printed and were given to the members of the Executive present.

It was moved by Dr. C. B. Stewart, seconded by Dr. E. W. Stewart: THAT the minutes of the Executive meeting of May 23rd be taken as read. —Carried.

Instructions to Delegates to Canadian Medical Association Council.

1. Report of Committee on Constitution and By-Laws: Dr. McKenty, Chairman of the Committee on Constitution and By-Laws of the Manitoba Medical Association, reported that his committee had held two meetings during the past winter, and he had been in communication with Dr. Harris, Chairman of the Committee on Constitution and By-Laws of the Canadian Medical Association.

Dr. McKenty read this letter, which contained a resolution, which had been adopted by the Committee on Federation, which reads:

"The committee recommends that the Manitoba Medical Association should change its status to that of a Division of the Canadian Medical Association, provided that (1) the Manitoba Medical Association shall retain such features of its constitution as it considers important, and, (2) that the Manitoba Medical Association may revert to the status of a branch if it so wishes after one year's notice of such intention."

It was moved by Dr. F. D. McKenty, seconded by Dr. O. C. Trainor: THAT the report of the committee be accepted. —Carried.

Dr. McKenty stated that he might be asked to discuss the report at the meeting of council, and he asked for instructions.

He then re-read the first paragraph in the letter with regard to the definition of the functions of the Canadian Medical Association and the Manitoba Medical Association, and asked if he could be instructed to make a statement to council along these lines.

The committee agreed.

2. Report of Committee on Sociology re. Health Insurance: Dr. Moorhead read the minutes of the meeting of the Committee on Sociology held on June 8th with the following motion:

"That the committee recommend that the Executive Committee instruct the delegates to council to support the recommendations of the Committee on Economics of the Canadian Medical Association, but should recommend that the Canadian Medical Association should formulate the general principles required in a medical service for the nation on the lines of the proposals of the British Medical Association, stating that the amount of service required, its cost, and the cost and method of administration will require a detailed fact finding investigation, and that the Canadian Medical Association should at once set up the machinery to secure the necessary information, and that the proposals of the Canadian Medical Association be made available to the governments and the public by the publishing of a pamphlet or otherwise."

It was moved by Dr. E. S. Moorhead, seconded by Dr. C. B. Stewart: THAT the report of the Committee on Sociology be adopted. —Carried.

Letter from Dr. Hamlin.

Dr. Moorhead read a letter received from the secretary of the Portage la Prairie Medical Society.

Dr. Trainor pointed out that the resolution passed at the meeting of the Sociology Committee on May 17th with regard to sending an officer out to help the local practitioners negotiate with the council, was too restricted.

After prolonged discussion, it was moved by Dr. O. C. Trainor, seconded by Dr. Geo. Brock: THAT the resolution be amended by the addition of "or from the organized medical society." —Carried.

Dr. Strong's Letter re. Workmen's Compensation Board.

The secretary stated that he had written to Dr. Strong on three occasions and asked him to comment on the report of the Special Committee appointed to deal with the matter. The secretary then read the report of this committee.

It was moved by Dr. W. W. Musgrove, seconded by Dr. W. E. Campbell: THAT in view of Dr. Strong not replying to three letters asking him to comment on the report that the report be filed on the assumption that Dr. Strong is satisfied. —Carried.

Annual Meeting
Provisional Programme

MONDAY, SEPTEMBER 11th

Morning

Royal Alexandra Hotel

9.00 **Registration.**

Scientific Meeting.
Chairman, W. E. CAMPBELL, M.D. (Man.).

9.30 **Observations on the Higher Voltage X-Ray Therapy in Malignancy.**
B. R. MOONEY, M.D. (Wes.).

9.50 **Cervical Stenosis.**
D. S. MacKAY, F.R.C.O.G.

10.10 **Intermission.**

10.20 **Caecostomy, a Simple and Safe Measure in Diseases of the Colon.**
ROSCOE R. GRAHAM, F.R.C.S. (C.).

11.05 **Intermission.**

11.15 **The Principles of Artificial Feeding of Infants.**
H. B. CUSHING, M.D. (McG.).

Afternoon

Royal Alexandra Hotel

12.30 **Luncheon.**

Lower Fort Garry

3.00 **Garden Party.**

Evening

Royal Alexandra Hotel

Meeting: Medical Economics.
Chairman, S. W. PETERS, M.D. (Man.).

8.00 **The Development of Health Insurance Throughout the World and its Bearing on Medical Economics in Canada.**
HUGH H. WOLFENDEN, Esq., F.I.A., F.A.S., F.S.S.

9.00 **The Relief Medical Service in Ontario.**
T. C. ROUTLEY, F.R.C.P. (C.).

9.15 **The Relief Medical Service in Winnipeg.**
E. S. MOORHEAD, F.R.C.P. (C.).

9.30 **Morbidity Survey in Manitoba.**
F. W. JACKSON, D.P.H. (Tor.).

TUESDAY, SEPTEMBER 12th

Morning

Medical College.

Clinical Meeting.
Chairman, J. D. ADAMSON, M.R.C.P. (Edin.).

9.30 **Clinical Demonstrations.**
Clinical Cases will be described by members of the staffs of local hospitals and discussed by the visiting clinicians. Medical, Surgical, Gynaecological, Paediatric, Urological cases of interest to the general practitioner will be presented and discussed.

Afternoon

Royal Alexandra Hotel

1.00 **Luncheon.**
Presidential Address.

2.00 **Annual General Meeting.**

Evening

Royal Alexandra Hotel

7.15 **Annual Dinner and Dance.**

GUEST SPEAKERS

Frank S. Patch, B.A., M.D., C.M., F.R.C.S. (C.), Professor of Surgery, McGill University, Montreal, and President-Elect of the Canadian Medical Association.

H. B. Cushing, B.A., M.D., C.M., Emeritus Professor of Paediatrics, McGill University, Montreal.

Roscoe R. Graham, M.B., F.R.C.S. (C.), Assistant Professor of Surgery, University of Toronto.

W. G. Cosbie, M.D., M.B., F.R.C.S. (C.), F.R.C.-O.G., Senior Demonstrator in Obstetrics and Gynaecology, University of Toronto.

C. H. Vrooman, M.D., C.M. (Man.), F.R.C.P. (C.), Vancouver.

Hugh H. Wolfenden, F.I.A., F.A.S., F.S.S., Toronto, the Consulting Actuary and Statistician.

T. C. Routley, M.D., LL.D., F.R.C.P. (C.), General Secretary, Canadian Medical Association.

Registration at the Royal Alexandra Hotel, Monday, September 11th, at 9 a.m.

The scientific meetings will be at the Royal Alexandra Hotel.

The clinical sessions will be held at the Medical College. There will be presentation of cases with discussion by the visiting clinicians.

Winnipeg, September 11-12-13

Royal Alexandra Hotel

WEDNESDAY, SEPTEMBER 13th

Morning
Royal Alexandra Hotel

Scientific Meeting.
Chairman, C. B. STEWART, F.R.C.S. (Edin.).

9.30 **The Results in Treatment of Fractures of the Femur in Children.**
A. P. MacKINNON, F.R.C.S. (C.).

9.50 **The Importance of Early Diagnosis in Urinary Tract Tumours.**
FRANK S. PATCH, F.R.C.S. (C.).

10.30 **Intermission.**

10.40 **Pleuritis.**
C. H. VROOMAN, F.R.C.P. (C.).

11.20 **Intermission.**

11.30 **Maternal Mortality.**
W. G. COSBIE, F.R.C.O.G.

Afternoon
Golf Club

2.00 **Annual Golf Tournament.**

LADIES' PROGRAMME

MONDAY, SEPTEMBER 11th

Afternoon
Lower Fort Garry

3.00 **Garden Party.**

Evening
Residence of Dr. S. G. Herbert

8.00 **Bridge** — for wives of visiting doctors.

WEDNESDAY, SEPTEMBER 13th

Morning
Golf Club

9.00 **Golf.**

TUESDAY, SEPTEMBER 12th

Afternoon
Manitoba Club

1.00 **Luncheon.**
Wives of the members of the retiring executive will be guests of Mrs. S. W. Peters at the Manitoba Club.

Evening
Royal Alexandra Hotel

7.15 **Annual Dinner and Dance.**

PUBLIC MEETING

MONDAY, SEPTEMBER 11th

Evening
Winnipeg Auditorium

8.30 **Public Lecture.**
ROSCOE R. GRAHAM, M.B., F.R.C.S. (C.), will deliver a popular lecture on Cancer. In addition, another visiting physician will discuss a subject of special interest to the laiety. Wives of the members of the Association and their friends are urged to attend this meeting.

An interesting and instructive group of scientific exhibits are being arranged.

Several pharmaceutical and instrument manufactures will have booths among the commercial exhibits.

Luncheons, golf, afternoon tea and other functions are being arranged for the ladies.

All golfers are invited to enter the annual golf tournament.

There will be a special session on medical economics at which Mr. Hugh H. Wolfenden, F.I.A., F.A.S., F.S.S., the Consulting Actuary, will deliver an address and there will be discussion of current problems of medical economics.

The Annual General Meeting will review the work of the association.

The Annual Dinner and Dance will be held in the Crystal Ballroom of the Royal Alexandra Hotel.

The subjects to be discussed at the scientific session and clinical meetings will be of importance to the practicing doctor.

Plan now to attend the Annual Meeting of the Manitoba Medical Association, and make your reservations early.

Department of Health and Public Welfare

NEWS ITEMS

FOOD AND FOOD POISONING

The following article, by Dr. Samuel Frant, Epidemiologist and Director, Bureau of Preventable Diseases, New York City Department of Health, was recently published in the publication "Preventive Medicine" and we are quoting it herewith trusting our readers will find it as interesting as we have:

"One of the outstanding accomplishments of the twentieth century is the sound knowledge of the ways along which pestilence travels, and how epidemic disease can be prevented. Unfortunately much of this knowledge is still not adequately utilized. How well it can be taken advantage of has been shown in the recent report[1] of Castellani, Surgeon-in-Chief of the Italian Army in Africa. By insisting upon surprisingly simple and well-known preventive measures, he was able to keep the morbidity rate of the Ethiopian army, fighting under the most primitive of conditions in a climate and land rife with disease, lower even than that of the soldiers at home. This is all the more remarkable when we consider that most tacticians felt that this campaign would fail more because of the enormous incidence of tropical disease in the unacclimated Italian soldier, than because of any other single factor.

"Civil life offers no less remarkable instances of the triumphs of modern sanitation. For example, in New York City no disease has been traced to the public water supply since 1907. No outbreak of milk-borne disease since 1912. Much of the credit for this, it is true, belongs to the sanitary engineer. His province is peculiarly the environment of man as he lives together with other men, and pure water, safe milk, adequate disposal of sewage, and the host of other sanitary measures so effectively employed, are his responsibility and his achievement.

"It may be of interest to review briefly these modern sanitary procedures usually arrived at in every civilized community, these safeguards which are part of our modern heritage.

HOW A MODERN CITY IS PROTECTED

"Water: First, of course, is a safe public water supply, from an unpolluted source, guarded against contamination throughout its entire course, filtered or otherwise treated, chlorinated for safety, and continually checked for adequate residual chlorine content. There must never be a chance of pollution, never the possibility of failure, no matter what extra demands are put upon it, and never the danger of mixture with any less protected water supply.

"Sewage: Next comes proper sewage disposal, adequate and effective, with no cross connections to the water or food of the community. It must be rendered completely harmless before final disposal far from the source of the public water supply.

"Milk: The third modern factor in the prevention of communicable disease is safe milk, of necessity from cows free from communicable disease, maintained under ideal conditions. Above all, this means milk from cows free from tuberculosis. As is well known, by no means every herd of cows is so happily situated. In fact, it is only since last year that New York State has become an accredited tuberculosis-free area, containing less than ½ per cent. of tuberculin-positive cows. As knowledge grows of other diseases of cattle, veterinarians are endeavoring to eliminate herds in which either contagious abortion (Bang's disease) or infectious mastitis are present. These projects are even more ambitious than the eradication of bovine tuberculosis, but there is every indication that in the near future they may be realized. How extensive this problem of safeguarding milk in large communities is, may be better understood when it is realized that over 3 million quarts of milk are consumed daily in New York City, this milk coming from a radius of over 300 miles.

"Other Foods: Of next importance in this survey are food and food products, especially meat, poultry and fish. Almost 2 billion pounds of these foodstuffs come into New York City each year, and are either consumed or handled in the metropolitan area. Ninety-nine per cent. of these meats is inspected by veterinarians of the United States Department of Agriculture, thus insuring freedom from disease and wholesomeness for human consumption. Under the Meat Inspection Act of 1906, these inspections include ante and post-mortem examinations, and investigations to see that the animals are slaughtered, handled and stored under proper sanitary conditions. Pork requires special attention. As is well known, at least 2 per cent. of the hogs of the country are infested with trichinae, the cycle of the parasite being kept alive by trichinous rats eaten by hogs and by the feeding of pork scraps containing trichinae to other hogs. Pork and pork products customarily eaten raw are required to be so refrigerated or treated as to contain no live trichinae. Warnings to cook fresh pork adequately are continually being broadcast: — thorough cooking will kill all trichinae and make pork safe to eat.

"In the case of eggs, protection of wholesomeness is assured by national and state laws regulating the grading for size, quality and freshness. Vegetables and fruits are now grown and transported under the best of conditions, with no danger of contamination with night soil. The market for these foodstuffs has increased enormously with the growth of better transportation facilities and refrigeration. Cereals, breadstuffs and other staples of food made under good sanitary conditions, are kept protected from rodents and insects and adequately wrapped for transfer from maker to consumer. Supervision of fish is the rule, with adequate refrigeration before sale. Shellfish must be grown in approved waters and kept free from contamination by sewage while stored. Mushrooms, too, are carefully grown, by expert mycologists.

"Beverages: In the case of beverages, the public, by continued inspection and laboratory tests, is protected from those artificial colors and flavors which may possibly be injurious. Careful inspections are made at various manufacturing plants to see that all equipment is properly cleansed and that manufacture occurs under proper sanitary conditions. Installation of sterilizers is required to insure adequate cleanliness of all bottles and equipment. Alcoholic beverages also come within the province of modern health protection; for example, in the laws to prevent the use of wood alcohol as an adulterant.

"In this entire field of protection of food, however, eternal vigilance is necessary, as is shown by the fact that 3¼ million pounds of unwholesome foods and milk were condemned in this city alone in 1937.

"In the modern community proper storage and refrigeration of foods is of outstanding importance. Just as the automobile in most cities has solved the problem of transmission of disease by the fly by banishing the horse and stable, so mechanical refrigeration has greatly diminished the problem of spoilage, and has given the city dweller a means of keeping fresh for daily use his small supply of food.

HOW MAY DISEASE BE SPREAD?

"All these multiple safeguards have to a large extent reduced enormously major outbreaks of disease in large communities. Unfortunately, however, there still remain many morbid conditions which may be traced to food or drink. A brief resume of these as seen by the modern public health officer, will aid in clarifying the entire question for the general practitioner, and enable him to determine his proper course of action in individual instances.

"Direct Transmission: First, food and drink may transmit disease merely as vehicles. This pathway is well-known in typhoid fever, cholera and dysentery epidemics, in milk transmission of tuberculosis, scarlet fever, septic sore throat and undulant fever, and in tenia and trichinosis infestations. This method of spread is fairly well controlled by adequate supervision of the slaughter of cattle, by supervising cases and carriers of disease, and professional foodhandler contacts. For example, in every case of communicable disease, other members of the family doing foodhandling are excluded. Every case of typhoid fever, paratyphoid fever, bacillary and amebic dysentery is followed up, and professional foodhandler contacts excluded from work until found free from the organisms of these diseases. Carriers are closely supervised and forbidden any occupation which involves handling of food for others. Strict watch on this group prevents much of the spread of these conditions.

"Contamination: Next, food and water may cause disease because of adulteration or admixture with deleterious or poisonous substances. Outstanding examples of these are the lead poisonings described in the literature, and endemic dental fluorosis found in regions with an excess fluorin in the water supply. Here, also, may be classed the poisonings due to the use in industry or agriculture of harmful substances. For example, poisonous chemicals are ingredients of fruit sprays. Some of this poison may dry and remain on the fruit. To prevent these from causing poisoning, standards for residual maxima are set up and careful check made of any sources of excess in spray residuals.

"Metabolic Products: Another group of disease-producing foods includes those which sometimes evolve toxic substances in the metabolism of the growing plant or vegetable; for example, poisoning from oxalic acid in rhubarb leaves, and potato poisoning due to the formation of solanin in potatoes at certain times of the year. Danger from non-edible mushrooms, and poisonings due to toxins in mussels may also be mentioned. Still another group of disorders traced to food are those due to allergic manifestations in susceptible individuals. These, of course, are well-known to all practitioners, and are illustrated by urticaria and allied skin conditions, or asthma, and the like.

"True Food Poisonings: Last remain the true food poisonings, manifested mainly by gastroenteric symptoms. These were formerly classed as 'ptomaine poisonings,' because of their supposed causal relationship to protein decomposition, but are now known to be due to the growth of bacteria or to their performed toxins. There are two main groups of food poisoning: food infections and food intoxications, corresponding to these two ways in which bacteria may cause disease.

WHAT IS FOOD POISONING?

"The Two Types: The food infections have an incubation period of from six hours to three days. Their main symptoms are nausea, vomiting, diarrhea, pain in the abdomen, fever and marked exhaustion. Post-mortem examinations usually reveal fatty degeneration of the liver. The food intoxications on the other hand have a much shorter incubation period (sometimes only a few hours) and because of the toxin already present, the symptoms are much more severe.

"Incidence: The incidence of the true food poisonings is uncertain, because of the great number of cases ordinarily not reported. Food poisoning often occurs in small groups of two or three persons, and there are probably many isolated manifestations of the syndrome, not diagnosed as such because only one person is known to be affected, and is considered suffering from some other condition. It is estimated that there are at least 15,000 to 20,000 cases a year in the United States, occurring most often in the summer. In New York City several hundred outbreaks involving over 1,000 persons are reported yearly. Of individuals partaking of a contaminated or infected food, from 75 to 100 per cent. become ill; the mortality, however, except in botulism is usually less than one per cent. There is no obvious sex or age distribution, except that the very young and the very old are more frequently and more severely attacked.

"The Food Infections: In the food infections, the bacteriological findings are of great interest. For many years it was considered that these disturbances were due to decomposition products formed from the foods themselves; now it is well established that the majority are due to organisms of the Salmonella group (formerly known as paratyphoid B). In this group, there are three main classes, S. enteritides, S. suipestifer and S. aertrycke. These food infections due to Salmonella are to be sharply differentiated, of course, from true paratyphoid fever which develops like true typhoid fever, and is a more or less long drawn out illness with fever, enlarged spleen, rose spots and a continued rise in the blood of agglutinins against the invading organism. Contrasted with this, the Salmonella food poisonings are of sharp onset and of short duration, with only a few days' rise of temperature and little or no agglutination reaction in the blood. There may be of course intermediate types. Seventy-five per cent. of all food poisoning cases are considered by some authorities as due to these three groups of Salmonella. For the most part the food which causes these outbreaks is of protein nature, often meat made up into prepared patties, or chopped and allowed to stand overngiht improperly refrigerated. The organisms of the Salmonella group can very frequently be recovered from such leftover products. Normal intestinal bacteria and other mildly pathogenic organisms have also been shown in a few instances to cause outbreaks of this type. For example, B. Proteus, atypical B. coli, B. dysenteriae, and the milk streptococci, to mention only a few, have been isolated from food or from the stools of patients in some food poisoning outbreaks.

"How do these organisms get into food? First, as a primary infection of the animal and of the meat used for human consumption. This was formerly often the case in Germany, where animals with symptoms of disease were permitted to be slaughtered for immediate use as food, the so-called emergency slaughter, or 'Notschlacht.' Next by contamination of wholesome meat by growth of organisms introduced by a human case or carrier; or from an outside source, such as excreta of mice or rats in places where food is prepared. Human carriers of Salmonella are known to exist but are uncommon. Mice and rats carry organisms of this group, either as natural hosts or as carriers of the so-called 'viruses' formerly often employed to exterminate them by causing outbreaks among them of mouse typhoid.

"The Food Intoxications—Botulism: The food intoxications consist of two main groups, those due to the toxins of the bacillus of botulism and those due to the toxins of the staphylococcus. Botulism was first described in Germany in 1820 as occurring after eating sausage; the organism itself was not isolated until 1896. In this food intoxication the incubation period usually is under 24 hours, varying at times, however, up to three days. Vomiting and constipation occur early, and cranial nerve paralyses soon follow. Coma, subnormal temperature and death supervene in over 50 per cent. of the cases. The pathology of the disease includes

thrombosis of the larger blood vessels and changes in the cells of the cerebral cortex. The organism is anaerobic, forming a very potent toxin, the fatal dose of which may be as low a 1/100 of a milligram. On ingestion the toxin passes through the gastro-intestinal tract unharmed and is absorbed quickly into the system. From 1900 to 1925 there were reported in the United States 146 outbreaks of botulism with 504 persons affected. Over this period the mortality was 67 per cent. The disease was formerly more frequent in the winter, because it is mainly spread by home canned foods eaten at this time of the year. Directly opposed to what is true of the food infections, where the food is ordinarily indistinguishable from wholesome food, the appearance of improperly canned food infected by the bacillus botulinus is often characteristic; there is frequently definite indication of spoilage. The last reported outbreak of botulism in New York City in 1920, was found to be due to olives. A fatal case was reported this year in the Bronx from home canned stringbeans, raised by the patient in her garden. Antitoxins for botulism are available, and if given very early, are of value. Since the early reports of botulism from commercially canned foods, the canners have greatly improved their sterilizing and canning processes; this has largely eliminated botulism resulting from commercially prepared products. The danger in home canning still exists, as the organism is ubiquitous; and only careful attention to all details of sterilization will prevent outbreaks from this source.

"Staphylococcic Food Poisoning: The other group of food intoxications is that due to the toxins of the staphylococcus, both S. albus and S. aureus. This condition was first described in 1930 by Dack and his co-workers, and has since been shown to be much more prevalent than was formerly realized. The incubation period here is also short, often only a few hours, and the ingestion of the toxin preformed in the food causes the rapid appearance of vomiting, diarrhea and collapse. The toxin has been isolated from suspected foods and has caused similar symptoms when fed to human volunteers. Many of the outbreaks due to staphylococcus toxin have been caused by custards and custard-filled foods. The organism seems to grow well and form its toxin in milk preparations, especially those which have not been prepared with sufficient heat or which after adequate preparation are not carefully and continually refrigerated. The organism may enter the food from dirty hands or some skin infection in a foodhandler. Prevention consists in adequate sterilization of the custard mixtures used, constant refrigeration and limitation of sale to cool weather.

HOW ARE FOOD POISONING OUTBREAKS HANDLED?

"In the investigation of food poisoning outbreaks, the most important step is a complete list of the persons affected, the particulars of each individual case, the history of the ingestion of the suspected food or foods and the search for evidence of the source of the infection of this food. Samples taken of the food, the vomitus, the stool and the blood of the patients, and any available autopsy material are of great value. Stool specimens of foodhandlers suspected of being carriers should also be examined, both bacteriologically and chemically. The practicing physician seeing these cases can help by transmitting immediately to the laboratory for examination specimens of vomitus, stool and the suspected food. In some instances the organism found to be the cause of an outbreak may be discovered in the excreta of mice harbored at the place of preparation. A case of this was the well-known New York City outbreak investigated by Salthe and Krumwiede,[2] and another has been reported from Providence by Staff and Grover.[3]

WHAT IS THE TREATMENT OF FOOD POISONING?

"In the main, the treatment of cases of food poisoning is symptomatic, except in botulism, when, if the diagnosis is made early, large doses of the proper antitoxin may be effective. The main public health measure, however, in food poisonings is prevention. This is being slowly accomplished. No longer are filthy and dirty food places allowed to continue, and no longer is mass production of food permitted except under the best of conditions. Communities are definitely aware of the fact that if they insist upon cleanliness in their food establishments they will get it, and campaigns such as have taken place in smaller towns where continued observation of the kitchens of food establishments is insisted upon, are of extreme value. Of major importance too in the prophylaxis of food poisonings are hygienic slaughtering and thorough meat inspection, and proper handling of food, by individuals free from disease or carrier states. Next come the proper storage of food and its complete protection from rodents and insects, adequate refrigeration and proper cooking. Last, and probably most important, is the education of the professional and home foodhandler in cleanliness. This is probably the firmest bulwark in the prevention of the transmission of disease through food.

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2. Salthe, O. & Krumwiede, C.: Paratyphoid-Enteritides Group; Epidemic of food infection due to paratyphoid bacillus of rodent origin, Am. J. Hygiene 4: 23-32 (Jan.) 1924.
3. Staff, E. E. & Grover, M. L.: Outbreak of Salmonella food infection caused by filled bakery products, Food Research 1: 465-479 (Sept.-Oct.) 1936.

COMMUNICABLE DISEASES REPORTED
Urban and Rural - May 21 to June 17, 1939.

Occurring in the Municipalities of:

Whooping Cough: Total 219—Transcona 169, Winnipeg 25, Ethelbert 9, Lawrence 6, Morris Rural 6, Rosedale 1, St. Boniface 1, St. James 1, Whitewater 1.

Chickenpox: Total 137—Winnipeg 34, Unorganized 26, Kildonan East 17, Hamiota Rural 10, St. Boniface 9, Brooklands 7, Flin Flon 6, Lorne 5, St. Andrews 5, Rosser 4, Strathclair 3, Hamiota Village 2, Brandon 1, Norfolk North 1, Pipestone 1, Rosedale 1, St. Paul East 1, Woodworth 1 (Late Reported: St. Boniface 3).

Mumps: Total 106—Winnipeg 94, Kildonan East 7, St. Boniface 2, Unorganized 2, Tuxedo 1.

Measles: Total 91—St. Boniface 51, Winkler 10, Minitonas 7, Winnipeg 6, Swan River Rural 5, Swan River Town 4, Melita 1, Portage City 1, Roland 1, Stanley 1, St. James 1, Tuxedo 1, Unorganized 1 (Late Reported: Morris Rural 1).

Tuberculosis: Total 61—Unorganized 9, Winnipeg 9, Lorne 6, Brandon 3, Kildonan East 3, Norfolk South 2, Portage City 2, Portage Rural 2, Strathcona 2, St. Clements 2, St. Vital 2, Armstrong 1, Cypress South 1, Dauphin Town 1, Dauphin Rural 1, Fort Garry 1, Grey 1, Hanover 1, Neepawa 1, Norfolk North 1, Ochre River 1, Rhineland 1, Rockwood 1, Rosser 1, Stonewall 1, St. Andrews 1, St. Boniface 1, St. Laurent 1, Tache 1, Transcona 1.

Scarlet Fever: Total 36—Winnipeg 15, Swan River Rural 6, Brandon 5, Unorganized 5, Brokenhead 1, Charleswood 1, Dufferin 1, Kildonan North 1 (Late Reported: Dufferin 1).

Diphtheria: Total 20—Winnipeg 15, Charleswood 1, Kildonan North 1, St. Andrews 1, St. Boniface 1, The Pas 1.

Influenza: Total 19—(Late Reported: Kildonan West 2, Rossburn Rural 2, Bifrost 1, Brandon 1, Dauphin Rural 1, Ericksdale 1, Gimli Rural 1, Grandview 1, Neepawa 1, Pipestone 1, Stanley 1, Unorganized 4, Springfield 1, Westbourne 1.

Typhoid Fever: Total 13—Selkirk 2, Springfield 1, Ste. Anne 1 (Late Reported: Selkirk 9).

Erysipelas: Total 5—Assiniboia 1, Franklin 1, Hanover 1, Transcona 1, Winnipeg 1.

Lobar Pneumonia: Total 5—(Late Reported: Hanover 1, Montcalm 1, Morris Rural 1, St. Boniface 1, Unorganized 1).

Tetanus: Total 3—Clanwilliam 1, Hamiota Village 1 (Late Reported: Oak Lake Town 1).

German Measles: Total 2—Rivers Town 1, St. Boniface 1.

Anterior Poliomyelitis: Total 1—Winnipeg 1.

Cerebrospinal Meningitis: Total 1—Winnipeg 1.

Puerperal Fever: Total 1—(Late Reported: Winnipeg Beach 1).

Septic Sore Throat: Total 1—Virden Town 1.

Vincent's Angina: Total 1—Unorganized 1.

Venereal Disease: Total 119 (June)—Gonorrhoea 67, Syphilis 52.

DEATHS FROM ALL CAUSES IN MANITOBA
For the Month of May, 1939.

URBAN—Cancer 36, Tuberculosis 6, Pneumonia (all forms) 5, Influenza 3, Syphilis 2, Cerebrospinal Meningitis 1, Diphtheria 1, Lethargic Encephalitis 1, Scarlet Fever 1, Typhoid Fever 1, Tetanus 1, Throat Infection 1, all others under one year 21, all other causes 168, Stillbirths 13. Total 261.

RURAL—Cancer 33, Influenza 18, Tuberculosis 15, Pneumonia (all forms) 7, Pneumonia (Lobar) 7, Typhoid Fever 5, Whooping Cough 4, Cerebrospinal Meningitis 1, Measles 1, Scarlet Fever 1, all others under one year 21, all other causes 145, Stillbirths 19. Total 277.

INDIAN—Tuberculosis 18, Influenza 11, Pneumonia (all forms) 7, Whooping Cough 4, Pneumonia (Lobar) 1, all others under one year 8, all other causes 3, Stillbirths 2. Total 54.

PRELIMINARY PROGRAMME
Thirty-Ninth Annual Meeting
CANADIAN TUBERCULOSIS ASSOCIATION

Royal Alexandra Hotel, Winnipeg
September 7-8-9, 1939

Papers will be read by the following:—Dr. P. W. Hardie, Mountain Sanatorium, Hamilton; Dr. H. C. Boughton, Saskatoon Sanatorium, Saskatoon; Dr. C. G. Shaver, Niagara Peninsula Sanatorium, St. Catharines; Dr. A. L. Paine, Manitoba Sanatorium, Ninette; Dr. Lasalle Laberge, Quebec; Dr. A. P. MacKinnon, Winnipeg; Dr. L. W. Thompson, Weston Sanatorium, Weston; Dr. G. S. Jeffrey and Dr. D. C. Marlatt, Fort William Sanatorium, Fort William; Dr. P. M. Andrus, Queen Alexandra Sanatorium, London; Dr. Thomas J. Kinsella, Minneapolis, Minn.; Dr. Erik Hedvall, University of Lund Tuberculosis Clinic, Lund, Sweden; Mr. W. P. Shahan, Executive Secretary, Illinois Tuberculosis Association; Dr. J. A. Myers, University of Minnesota; Dr. R. G. Ferguson, Fort Qu'Appelle; Dr. J. D. Adamson, St. Boniface Sanatorium, St. Vital; Dr. Harry C. Ballon and Albert Guernon, Montreal; Dr. Percy Moore, Indian Affairs Branch, Ottawa; Drs. J. A. and Gaétan Jarry, Montreal; Dr. Hugh E. Burke, Montreal.

A complete list of the subjects will be published in the September issue of the "Review."

Manitoba Medical Association

Annual Meeting Programme

MONDAY, SEPTEMBER 11th

Morning
Royal Alexandra Hotel

9.00 **Registration.**

Scientific Meeting.
Chairman, W. E. CAMPBELL, M.D. (Man.).

9.30 **Observations on the Higher Voltage X-Ray Therapy in Malignancy.**
B. R. MOONEY, M.D. (Wes.).

9.50 **Cervical Stenosis.**
D. S. MacKAY, F.R.C.O.G.

10.10 **Intermission: Exhibits.**

10.20 **Caecostomy, a Simple and Safe Measure in Diseases of the Colon.**
ROSCOE R. GRAHAM, F.R.C.S. (C.).
Discussion: P. H. T. Thorlakson, F.R.C.S. (C.).

11.05 **Intermission: Exhibits.**

11.15 **The Principles of Artificial Feeding of Infants.**
H. B. CUSHING, M.D. (McG.).
Discussion: Gordon Chown, F.R.C.P. (C.).

Afternoon
Royal Alexandra Hotel

12.30 **Luncheon.**

Lower Fort Garry

3.00 **Garden Party.**

Evening
Royal Alexandra Hotel

Meeting: Medical Economics.
Chairman, W. S. PETERS, M.D. (Man.).

8.00 **The Relief Medical Service in Winnipeg.**
E. S. MOORHEAD, F.R.C.P. (C.).

8.15 **Voluntary Health Insurance.**
J. A. HANNAH, M.D. (Q.).

8.30 **Morbidity Survey in Manitoba.**
F. W. JACKSON, D.P.H. (Tor.).

8.45 **The Development of Health Insurance Throughout the World and its Bearing on Medical Economics in Canada.**
HUGH H. WOLFENDEN, F.I.A., F.A.S., F.S.S.

TUESDAY, SEPTEMBER 12th

Morning
Medical College.

Clinical Meeting.
Chairman, J. D. ADAMSON, M.R.C.P. (Edin.).

9.30 **Clinical Demonstrations.**
Clinical Cases will be described by members of the staffs of local hospitals and discussed by the visiting clinicians. Medical, Surgical, Gynaecological, Paediatric, Urological cases of interest to the general practitioner will be presented and discussed.

Afternoon
Royal Alexandra Hotel

1.00 **Luncheon.**
Presidential Address.

2.00 **Annual General Meeting.**

Evening
Royal Alexandra Hotel

7.15 **Annual Dinner and Dance.**

GUEST SPEAKERS

Frank S. Patch, B.A., M.D., C.M., F.R.C.S. (C.), Professor of Surgery, McGill University, Montreal, and President-Elect of the Canadian Medical Association.

H. B. Cushing, B.A., M.D., C.M., Emeritus Professor of Paediatrics, McGill University, Montreal.

Roscoe R. Graham, M.B., F.R.C.S. (C.), Assistant Professor of Surgery, University of Toronto.

W. G. Cosbie, M.D., M.B., F.R.C.S. (C.), F.R.C.-O.G., Senior Demonstrator in Obstetrics and Gynaecology, University of Toronto.

C. H. Vrooman, M.D., C.M. (Man.), F.R.C.P. (C.), Vancouver.

Hugh H. Wolfenden, F.I.A., F.A.S., F.S.S., Toronto, the Consulting Actuary and Statistician.

T. C. Routley, M.D., LL.D., F.R.C.P. (C.), General Secretary, Canadian Medical Association.

J. A. Hannah, M.D., C.M. (Q.), Managing Director, Associated Medical Services (Inc.), Toronto.

The scientific meetings will be at the Royal Alexandra Hotel.

The clinical sessions will be held at the Medical College. There will be presentation of cases with discussion by the visiting clinicians.

Winnipeg, September 11-12-13

Royal Alexandra Hotel

WEDNESDAY, SEPTEMBER 13th

Morning
Royal Alexandra Hotel

Scientific Meeting.
Chairman, C. W. BURNS, F.R.C.S. (C.).

9.30 **The Results in Treatment of Fractures of the Femur in Children.**
A. P. MacKINNON, F.R.C.S. (C.), and W. B. MacKinnon, M.D. (Man.).

9.50 **The Importance of Early Diagnosis in Urinary Tract Tumours.**
FRANK S. PATCH, F.R.C.S. (C.).
Discussion: H. D. Morse, F.R.C.S. (C.).

10.30 **Intermission: Exhibits.**

10.40 **Pleuritis.**
C. H. VROOMAN, F.R.C.P. (C.).
Discussion: L. G. Bell, M.R.C.P. (Lond.).

11.20 **Intermission: Exhibits.**

11.30 **Maternal Mortality.**
W. G. COSBIE, F.R.C.O.G.
Discussion: J. D. McQueen, F.R.C.S. (C).

Afternoon
Pine Ridge Golf Club.

2.00 **Annual Golf Tournament.**

LADIES' PROGRAMME

MONDAY, SEPTEMBER 11th

Afternoon
Lower Fort Garry

3.00 **Garden Party.**

Evening
Residence of Mrs. S. G. Herbert.

8.00 **Bridge — for wives of visiting doctors.**

WEDNESDAY, SEPTEMBER 13th

Morning
Golf Club

9.00 **Golf.**

TUESDAY, SEPTEMBER 12th

Afternoon
Manitoba Club

1.00 **Luncheon.**
Wives of the members of the retiring executive will be guests of Mrs. W. S. Peters at the Manitoba Club.

Evening
Royal Alexandra Hotel

7.15 **Annual Dinner and Dance.**

PUBLIC MEETING

MONDAY, SEPTEMBER 11th

Evening
Winnipeg Auditorium

Public Lectures.

8.30 **Cancer.**
ROSCOE R. GRAHAM, M.B., F.R.C.S. (C.), Assistant Professor of Surgery, University of Toronto.

9.00 **Maternal Mortality.**
W. G. COSBIE, M.D., M.B., F.R.C.S. (C.), F.R.C.O.G., Senior Demonstrator in Obstetrics and Gynaecology, University of Toronto.

An interesting and instructive group of scientific exhibits are being arranged.

Pharmaceutical and instrument manufacturers will have booths among the commercial exhibits.

Luncheons, golf, afternoon tea and other functions are being arranged for the ladies.

All golfers are invited to enter the annual golf tournament at Pine Ridge Golf Club.

There will be a special session on medical economics at which Mr. Hugh H. Wolfenden, F.I.A., F.A.S., F.S.S., the Consulting Actuary, will deliver an address and there will be discussion of current problems of medical economics.

The Annual General Meeting will review the work of the association.

The Annual Dinner and Dance will be held in the Crystal Ballroom of the Royal Alexandra Hotel.

The subjects to be discussed at the scientific session and clinical meetings will be of importance to the practicing doctor.

Plan now to attend the Annual Meeting of the Manitoba Medical Association, and make your reservations early.

THE MANITOBA MEDICAL ASSOCIATION REVIEW
Vol. XIX., No. 9, September, 1939.

CONTENTS

Clinical Section

The Common Anaemias of Infancy*

By

JOHN N. CRAWFORD, M.D. (Man.)

Demonstrator in Paediatrics, University of Manitoba
Paediatrician to the St. Boniface General Hospital
Assistant Paediatrician
Children's Hospital of Winnipeg

It is common to find that whenever the subject of infantile anaemias is mentioned, listeners throw up their hands in horror. The subject is considered to be a complex maze through which one finds one's way with difficulty or not at all. It must be admitted that there are atypical forms of anaemia in childhood which cause a great deal of confusion. This is particularly true in erythroblastic anaemias and in those anaemias where the causative factor seems to be excessive red cell destruction. But for practical purposes, these rare and confusing types of anaemia are not of importance. Out of the morass of doubt surrounding the subject appears one fact of importance: that the majority of anaemias affecting infants and young children are deficiency anaemias. The deficiency may be one of hemopoietic function, or a deficiency of iron or some other essential part of the hemoglobin molesule. The important point is that stimulation of hemopoiesis or supplying the deficient blood-building material will bring about a cure.

In the treatment of these anaemias the most important therapeutic agent is iron, although other methods of therapy may be resorted to from time to time. This paper will serve its purpose if it emphasizes two points: That most childhood anaemias are deficiency anaemias; and that iron cures most of them. At the same time we shall give general consideration to the common forms of anaemia in infancy, and the methods of treatment in use in the Children's Hospital.

By definition anaemia is a state in which the hemoglobin is in less than normal proportion to the blood volume. Literature on the subject is filled with various classifications, all more or less complicated, which attempt to label all anaemias according to the blood picture or to the pathological tissues which produce them. Cooley suggests a classification which is admirable for our purpose, which is to keep the question under discussion as simple as possible.

We find then that an anaemia can result only from the following:

1. Direct blood loss, acute or chronic.
2. Failure of Red Cell formation.
3. Excessive Red Cell destruction.
4. Failure of hemoglobin formation.
5. Combinations of the preceding.

1. *Direct Blood Loss.*

The effect of direct blood loss in the production of an anaemia is obvious. Although the immediate effect is not one of reduction of hemoglobin in proportion to blood volume, the influx of fluid from other body tissues rapidly brings about such a state.

2. *Failure of Red Cell Formation.*

(a) Hypoplastic states of the marrow, or Aregenerative Anaemias. Here the erythropoietic activity of the marrow is partially or completely suspended although the capacity for function is still present. Hypoplasia is common in the anaemias due to infection, where the infection depresses the marrow. Similar are the anaemias in states of malnutrition where the general metabolic level is low and marrow function sluggish. Such marrow hypoplasia is manifested by an anaemia without the commonly recognized signs of red cell regeneration, such as macrocytes, polychromatophilia, reticulocytes or nucleated red cells. It is distinguished from the Aplastic states by the fact that there is not the extreme depression of leukopoiesis seen in the latter.

(b) Aplastic states.

In these there is destruction of so much marrow tissue that red cells sufficient for the body needs can no longer be produced. Such a state can be brought about by poisons such as benzol, arsphenamine, x-rays or radium; by septic processes; or by crowding out of the marrow by pathological tissue, as in leukemia, Hodgkin's disease or malignancy.

3. *Excessive Red Cell Destruction.*

Signs of red cell destruction may be found in many types of anaemia, but are not evidence that excessive destruction is the essential factor in the production of the anaemia. Many infectious conditions produce red cell destruction, usually by fragmentation, occasionally by phagocytosis. This may be due to the action of the toxin on the marrow, so that defective cells are produced, or to the action of the toxin on the red cell itself, making it more fragile. Infection at the same time produces hypoplasia of the marrow, and signs of hypoplasia may persist after signs of increased cell destruction have disappeared.

4. *Failure of Hemoglobin Formation.*

Considering the make up of the hemoglobin molecule it is evident that there can be more than one explanation for insufficient hemoglobin formation. Lack of available iron is an obvious and traditional explanation but, theoretically at least, lack of the pyrrhol nucleus or the amino acids that go into making the globin fraction can be

* Presented at the Post Graduate Course in Pediatrics, Faculty of Medicine, University of Manitoba, February, 1939.

responsible. In cases refractory to treatment with iron alone the response to therapy with substances other than iron may be evidence that deficiency of iron is not solely responsible. This will be dealt with later, when speaking of therapy.

5. *Combination of two or more factors.*

Seldom is one of the factors mentioned above solely responsible for an anaemia. For example, in infections, an anaemia may be produced in which the elements of hypoplasia and increased cell destruction are associated; or long continued bleeding so depletes the body of blood building materials that a deficiency results; or a nutritional anaemia, caused usually by lack of iron, is complicated sooner or later by an infection, adding a hemolytic element. Thus, from the standpoint of etiology, the question of anaemia is apt to be complex, and the blood pictures which one sees will vary with the factors which produce them.

In this paper we do not propose to discuss any of those rare but interesting types of anaemia which so vex the spirit of the hematologist. Any remarks will be limited to the three common types which affect infancy, and which are:

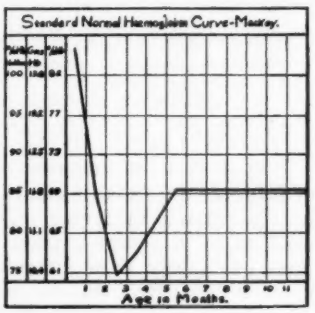
1. Physiological anaemia.
2. Anaemia of the premature infant and twins.
3. Dietary or Nutritional Anaemia, which may be simple or complicated by infection.

1. *Physiological Anaemia.*

It is scarcely correct to call this condition an anaemia at all, inasmuch as the definition of anaemia is one of a pathological state. Helen Mackay has emphasized the fact that the average hemoglobin value of infants at various ages varies considerably from the adult value. This work has been confirmed by many investigators in different parts of the world on various classes of the population. The actual values reported by these other observers do not agree exactly with those reported by Mackay, the differences depending largely upon the part of the country and the class of population from which the material is drawn. All estimations however show the same general type of curve. The hemoglobin value at birth is high, and declines rapidly to the third month of life. This is followed by a rise to the sixth month. The six month value is pretty well maintained till the end of the second year. Thereafter there is a gradual rise to the age of puberty, when the adult values are reached.

Breast fed babies and artificially fed babies show the same type of curve, but the values are higher in the breast fed group. Mackay showed that the routine administration of iron resulted in a higher average value, with a similar type of curve. Josephs, in Baltimore, obtained a similar result in a control group in which all possibility of infection was avoided. Probably the differences reported by various investigators depend upon the nutrition of the infants, the home hygiene and the health and diet of the mothers during pregnancy.

Mackay's figures are reported from a group of dispensary patients in the east end of London, living under what could be considered very poor conditions. Figure 1 is a representation of the values reported from this group. They can probably be accepted as low normal values for hemoglobin at various ages.



Whether or not one accepts these exact values as being normal, it is evident that there is a low level of hemoglobin during childhood, especially during the first two years. This is physiological, and is probably due to a lag in hemopoietic function as compared with the general growth of this period. The point to be made is this, that one should not expect hemoglobin values of 100% in infancy and thus be led into the error of considering every low hemoglobin value as evidence of a pathological condition.

Whether or not one accepts these exact values as being normal, it is evident that there is a low level of hemoglobin during childhood, especially during the first two years. This is physiological, and is probably due to a lag in hemopoietic function as compared with the general growth of this period. The point to be made is this, that one should not expect hemoglobin values of 100% in infancy and thus be led into the error of considering every low hemoglobin value as evidence of a pathological condition.

2. *The Anaemia of Premature Infants and Twins.*

It is well known that all premature infants and most twins are prone to develop anaemia. It has been taught ever since the turn of the century that this anaemia is due to the early depletion of the iron reserves of the body. At that time Bunge and Hugounenq showed that about two thirds of the iron reserve of the body was laid down in the last three months of pregnancy, chiefly in the liver. The possibility of insufficient reserve or early depletion in the premature is obvious. In addition, the rapid rate of growth in the premature or small twin results in a rapid exhaustion of the liver iron, relative to the growth rate of the rest of the body.

Not all authorities adhere to the theory of deficient iron storage. Gladstone has recently shown that instead of a sudden increase in the amount of iron laid down in the last intrauterine months there is a steady moderate deposition, greatly augmented by physiological hemolysis in the first week of extrauterine life. Still others, Baar in particular, feel that the anaemia of the premature is merely an exaggeration of the physiological anaemia mentioned above.

The treatment of this anaemia, both active and prophylactic, consists in the administration of inorganic iron. This will be dealt with later. Inasmuch as the symptoms are not manifested before the third month, and as iron may cause a digestive upset in the very young, it is probably not advisable to give iron prophylactically before the fourth week of life.

3. (*a*) *Simple Nutritional Anaemia.*

Dietary factors can be considered to cause an anaemia in either of two ways:

1. By lack of something in the diet needed for blood building.
2. By the presence in the food of something actually harmful to the bone marrow or the formed cells.

The most conspicuous example of a nutritional anaemia is that which results from the overlong use of a milk diet without proper additions. Milk contains less iron than any other substance commonly used in infant diets. It is arbitrarily assumed that the iron reserve of the liver is exhausted by the sixth or seventh month of life unless adequate replacement is made by suitable additions to the diet.

On the face of it, this would appear to indicate that such anaemias are caused by lack of iron in the diet, but certain other factors must be considered. Naturally vitamins have been suspected of relationship with nutritional anaemias, particularly B complex. It is true that in experimental rats with nutritional anaemia yeast has proved an effective therapeutic agent. However, yeast has not proved to be particularly valuable in the treatment of children.

Infection plays an important role. Many nutritional anaemias appear to be precipitated by infection, and a severe infection will interfere with the effectiveness of iron therapy. It has already been stated that where Mackay prevented the development of nutritional anaemia by the use of iron, Josephs produced the same results by the prevention of infection.

In some nutritional anaemias iron therapy may bring about a slow improvement, but the deficiency appears to be more complex than iron lack alone. Here the use of agents containing hemoglobin-building materials other than iron, such as liver extracts or transfusion, may be effective.

The possibility of a definite harmful substance in the diet producing an anaemia is still discussed by some European writers. The idea of a toxic substance in cows milk was introduced by the Czerny school. The theory is that the fatty acids of milk have a hemolytic action. This attitude has been generally abandoned on this continent, and milk anaemias now are considered to be deficiency anaemias, with frequently some predisposing or precipitating factor such as infection playing a part.

(*b*) Nutritional anaemia complicated by infection.

Where repeated mild or severe infections are associated with a nutritional anaemia a more complex state of affairs exists than in an uncomplicated nutritional anaemia. The one acts upon the other so that a vicious circle is set up. The anaemia is apt to be severe, and the blood picture changed by the element of infection. Treatment with iron alone is not likely to be effective. Splenic enlargement is common in such cases. It is not unusual for the exact nature of such an anaemia to go unrecognized.

Treatment of the Anaemias of Infancy

In simple nutritional anaemias and in the anaemia of prematures and twins, iron in large doses is usually effective. Iron has two effects; it stimulates hemopoiesis and supplies an essential part of the hemoglobin molecule. Iron has no effect unless hemopoiesis is stimulated. An example is seen in the first six weeks of life, where iron administration will not halt the rapid drop in hemoglobin. During infections, when the bone marrow is depressed, iron has no effect or a greatly diminished effect, depending upon the severity of the infection. In aplastic anaemias, iron is useless. Josephs sums up the status of iron very neatly:

"To say that a marked response to iron therapy is proof that the anaemia is due to a lack of iron is true in one sense, but if the same reasoning is applied to other diseases, one might say that malaria is due to a lack of quinine, or generally that any disease is due to a lack of the substance which cures it."

Iron should be given in inorganic form. Of the iron contained in foods, not all is available for utilization in anaemia. The maximum effect is obtained by flooding the body with a large excess of readily available iron, and food iron is either insufficient in amount or is not easily enough available to achieve this. One feels that this does not apply to the prophylactic use of iron containing foods in healthy infants.

The greater value of ferrous iron over ferric iron has not been demonstrated. The salt which we use, iron and ammonium citrate, is a ferric salt, and has been found effective in the hands of most observers. This may be given as a ten or twenty-five per cent. solution, placed in the feedings of the infant. For older children, the taste may be effectively covered with syrup of orange and chloroform water. The usual dose of the double citrate is ten grains, three times a day. We have done a little work using massive doses, up to one hundred grains a day. The results have been good, but probably not sufficiently spectacular to warrant the risk of gastro-intestinal upset which attends the routine use of such a dosage.

Most preparations of iron contain impurities in the form of manganese and copper, and it does not seem necessary to increase the amount of catalyst. Some of our cases have received copper

sulphate in addition to iron, but the results have not been markedly better than with the use of iron alone. Cooley states that he is losing his enthusiasm for copper as a catalytic agent, and now uses liver in conjunction with iron as a routine mixture. Kato reports that cobalt is a useful catalyst.

Liver or liver extract alone is not particularly useful in the anaemias of childhood as we do not have to deal with a picture that exactly resembles pernicious anaemia in the adult. In combination with iron it may be very useful, particularly in those more complex forms of deficiency anaemia where iron lack alone is not the only etiological factor.

Transfusion is frequently a life saving form of treatment. Apart altogether from the immediate effect of transfusion, which is to raise the level of hemoglobin and red cells in the blood stream of the recipient, there is often a direct or indirect action on the process which is causing the anaemia. Thus, it is useful in infections, where other forms of therapy are of little value. It may supply antibodies. It may improve the condition of the patient so that he can better withstand the infection. It may break the vicious circle in nutritional anaemia complicated by infection. It may save life by tiding the patient over a critical period.

The question of treatment may be summed up in a few lines. Inorganic iron is a suitable form of therapy in uncomplicated nutritional anaemia, and in the anaemia of twins and prematures. Where infection is present, transfusion is the most generally useful method of treatment. Where the deficiency causing the anaemia is more complex than iron lack alone, iron therapy may require to be supplemented by some other agent, such as liver extract.

The History of Urinary Calculus*

By

DAVID SWARTZ, M.D. (Man.), F.R.C.S. (Edin.)
Demonstrator in Anatomy, University of Manitoba
Urologist, Grace Hospital, Winnipeg
Assistant Urologist, Misericordia Hospital, Winnipeg

The story of urinary tract calculus is as old as the science of medicine itself. Written contributions on the subject by such scholarly ancients as Hippocrates, Galen, Celsus and Alexander indicate that in those days a scientific understanding of the condition was possessed and that surgical procedures were in vogue. When light upon the subject first appeared, following the prehistoric period, it was found to emanate from several widely separated regions, namely, India, Mesopotamia, Egypt and Greece. Of the earliest period, we possess only a very fragmentary knowledge, based entirely on circumstantial evidence. After the lapse of hundreds or perhaps thousands of years there was inaugurated the practice of making records and this led to a more comprehensive scientific era.

The early Babylonians who inhabited Mesopotamia, the region between the Tigris and Euphrates rivers, possessed a civilization which at 4000 B.C. had attained a wonderful degree of development. The cultivation of the arts and the natural sciences, especially astronomy and mathematics, had reached a high degree of perfection, but the science of medicine received very little attention and consequently made only insignificant advances. Surgery in particular was very poorly developed because of the severe laws enacted to punish unsuccessful operators. The following extract exemplifies this:

> "If a physician makes a deep wound with an operating knife of bronze and the patient dies or if he opens a tumor with such a knife and the patient's eye is thereby destroyed, the operator shall be punished by having his hands cut off."

Although urinary calculus as an entity was recognized the operation was considered a very formidable one and the Babylonian surgeons were afraid to tackle it. Herodotus, who visited Mesopotamia in 300 B.C. made the statement "that there were no physicians in Babylon."

Information regarding the knowledge of medicine possessed by the Ancient Egyptians dates back to about 3000 B.C. The healing art was entirely in the hands of temple priests who formed an organized body with a sort of physician in chief at its head. Their knowledge of surgery reached a degree well in advance of that of any of their contemporaries. Their skill in manufacturing surgical instruments is amply revealed in the specimens, knives, hooks, forceps, metal sounds and probes, etc., which have been dug up at the various sites of ancient ruins.

The Egyptians were the first to practise extraction of stone through the natural passages. A description of such an operation by the Arabian physician Haly was handed down by Proper Albinus. A synopsis of this description follows:

> A pipe of ivory or wood of proper size was introduced into the bladder per urethra and air introduced; when the bladder was sufficiently distended the proximal opening of the tube was tightly corked. With one finger in the rectum the stone was forced into the vesical neck. This was followed by suprapubic pressure and the cork removed. Force of expelled air carried the stone into the posterior urethra and with further dilatation of the anterior urethra the stone was removed.

This of course only applied to small stones.

For larger stones the early Egyptians practised lithotomy but the mortality was very high. Ammonius of Alexandria performed many such operations and in recognition of his great skill became known as Ammonius Lithotomos.

The early Arabians sought the aid of chemistry to relieve man of this condition but soon realized its uncertainty and began to resort to manipulative

* Read before the Winnipeg Medical History Club in January, 1939.

and surgical procedures. The Arabian Albucaris described the operation of perineal lithotomy as follows:

> "Having cleared out the bowels with a clyster, the patient is to be shaken so as to make the stone descend and he is then to be secured in the arm of an assistant with his hands under his nates. The surgeon then presses upon the perineum and if the stone be felt the operation is proceeded with. Otherwise the index finger of the left hand if the patient be a child and the middle finger if an adult is introduced into the anus and the stone is thereby gradually brought down to the neck of the bladder. Having pushed it outward to the place where it is meant to make the incision, an assistant is directed to press downward upon the bladder from above the pubes while another draws up the testicles with one hand and with the other stretches the skin under them. Then with a scalpel the operator makes an incision between the anus and the testicles straight upon the stone which is to be pressed out by the finger. The incision is oblique, large externally but internally of the size of the stone. If the stone is large it is broken down with a forceps. If more than one stone is present the largest is dealt with first."

His description of the operation in women involved the assistance of a "dexterous midwife" to introduce her finger into the rectum or vagina and press the stone down to the left hip. The operator incises over it, then with the aid of a sound dilates the opening and extracts the stone.

The practice of lithotomy appears to have been reckoned a disreputable occupation amongst the Arabians. Avenzoar mentioned it as an operation which an honest, upright, respectable man would not witness, far less perform.

Haly Abbas ascribed the formation of stone to the "concurrence of a viscid humor with heat of the part." "Old men," he said, "were most subject to renal calculi for in them the watery part of the urine passes down the bladder whilst the sediment is detained in the kidneys and is converted to stone." "Children," he said, "are most liable to calculi in the bladder owing to their eating much grosse food and taking exercise after meals by which means the system is loaded with grosse impurities." With regard to treatment he enjoined restricted diet, abstinence from "grosse food" and the use of medicines of an "incisive and attenuant nature." The general treatment during a "fit of gravel" is well laid down by Alsaharavius which consisted in bleeding, cupping, tepid baths, emollient clysters, etc.

After Cyrus the Great put an end to Babylon as a power among the nations, the Persians became the leaders in all affairs not only in Asia Minor but the entire country from India to the shores of the Mediterranean. Their belief that the touching of a corpse produced a special contamination interfered most seriously with the study of anatomy and therefore prevented any real advances in medicine and surgery. Their chief contribution to medicine in general and stone in particular was made during the 5th century A.D. when European civilization was hastening to destruction. At that time they gave shelter to the classical culture and medical knowledge of the Greeks, then passed it on to the conquering Arabs.

For many centuries B.C. cutting for stone was performed in India; but the influence of this country on medicine in general was completely overshadowed by that of the Greeks who were flourishing during this period.

Modern medicine really derives its origin from the Greeks. The poems of Homer, The Iliad and The Odyssey, written about 800 B.C., furnish us with the earliest and almost the only written evidence of the state of medicine in Greece at the dawn of history. Aesculapius, who is supposed to have lived about 1500 B.C., is mentioned in The Iliad. Many centuries later, in the year 420 B.C., he was deified in the city of Athens.

The ancient Greeks were quite conversant with the problem of urinary calculus. They recognized stone in the kidney and stone in the bladder. For the former they prescribed lithontriptics or agents, which taken internally were supposed to cause solution of the calculus. For stone in the bladder they advised surgery.

Hippocrates, in his description of calculus stated that,

> "Stones are formed from phlegm which has been converted into sand. The formation of the stone is the product of a preternatural heat in the bladder with a thick and turbid state of the urine."

He recommended fomentations, purges and tepid baths. He intimated, however, that when a stone is fairly formed the only hope is operation. Because of its high mortality Hippocrates characterized the operation of lithotomy as cruel and murderous and made the statement that all bladder wounds were mortal. It would appear that in those days lithotomy was a separate branch of the profession since Hippocrates in his famous oath vowed,

> "I will cut no one whatever for stone but will give way to those who work at this practise."

The operation was held in such disrepute that as a result lithotomy remained in the hands of latro-surgeons for many years after his time.

Galen advocated the use of "lithontripties of a cutting and detergent nature." He mentioned pepper, galbanium, aphronitrum, asarabacca, etc. He recognized the value of lithotomy.

Aretaeus recommended quick lime and honied water. When a stone obstructed he said either to push it back into the bladder or cut the vesical neck. He stated that navigation and living at sea were beneficial in all affections of the kidneys. This accords well with modern statistics of calculus disease.

During the last couple of centuries B.C. Rome had no lithotomist. Archagathus, the first to propose to cut for stone, had lived in Rome about

200 B.C. but he had been banished and from that time lithotomy was not performed in Rome until the time of Celsus. Celsus flourished about the beginning of the Christian era, and was the earliest author to describe lithotomy. It is thought that Celsus acquired this knowledge from the Greeks who in turn had obtained it from the Egyptians, for by this time the surgeons of Alexandria had acquired great proficiency at this procedure. He forbade the operation until every other method had failed. He also disallowed it in children between the ages of 9 and 14 and in the season of spring. Celsus insisted that the bladder must not be wounded for such wounds were always fatal. His description follows:

> "When the stone is brought to rest on the neck of the bladder a lunated incision must be made in the skin near the anus as far as the neck of the bladder with the horns pointing a little towards the ischia, then in the part where the bottom of the wound is straighter, again under the skin another transverse wound must be made by which the neck may be cut till the urinary passage be opened in such a manner that the wound is something larger than the stone."

Not infrequently the rectum was sliced and the surgeon's fingers were wounded. If the stone could not be pressed out with the fingers it was drawn out with a hook. Thus a knife and hook were the only essential instruments. Because of the absence of many instruments it was referred to as the "lesser apparatus operation." To obviate post-operative haemorrhage "the patient should sit down in sharp vinegar to which a little salt has been added, under the use of which, most commonly does not only the bleeding subside, but the bladder is constringed and therefore less inflamed." With minor alterations this operation flourished for 1600 years.

When Marianus Sanctus in 1535 improved this operation and used additional instruments it became known as the "greater apparatus operation."

The Greek, Paulus Aegenita, who lived about 600 A.D., in his book on Medicine, described renal colic as follows:

> "It is a common symptom of colic and of calculus in the kidney that the belly is at first constipated with violent pain, anorexia, and tormina, but it is peculiar of colic to have all these symptoms more intense whereas in nephritic they are less so; the passage of the feces is completely obstructed so that not even flatus can pass, or when with difficulty the feces are evacuated they are flatulent and resemble the dung of oxen or sometimes a vitreous phlegm is discharged and the urine is voided freely and is of a pituitous nature. There is a pain in the kidneys as if transfixed with a sharp pointed instrument and the corresponding testicle is pained and there is torpor in the thigh of the same side."

Referring to stones in the bladder he wrote:

> "The symptoms of these are unconcocted and whitish urine with a sandy sediment. The patients rub constantly and handle the member, stretch it, and make incessant attempts to pass water and are troubled with strangury."
>
> "Wherefore the material cause of the formation of stones is a thick and terrene humor but the efficient is a fiery heat of the kidneys or bladder."

For colic he recommended the use of lithontriptics composed of a most conglomerate combination of substances, also cataplasms, fomentations and hip baths. He referred confidently to goat's blood as a solvent and observed that solvents wrongly given increased the size of the stone.

He advised that "when stones are too large or become impacted at the bladder neck we must have recourse to concussion, catheterism or even lithotomy."

Of lithotomy he stated,

> "Children up to the age of 14 are the best subjects for operation on account of the softness of their bodies. Old men are difficult to cure because ulcers of their bodies do not readily heal. And the intermediate ages have an intermediate chance of recovery."

Paulus Aegenita's description of perineal lithotomy is similar to that of Celsus.

His method for the removal of urethral calculus follows:

> "If the stone be small and fall into the penis and cannot be voided with the urine, draw the prepuce strongly forward and bind it at the extremity of the glans. Apply a ligature round the penis, making constriction at the extremity next the bladder; make an incision upon the stone, bending the penis and ejecting the stone; undo the ligatures and clear away the coagula from the wound. The posterior ligature is applied lest the calculus should retreat and the anterior, in order that when untied and extraction of the stone, the skin of the prepuce may slide backwards and cover the incision."

Many years after Christianity was established the practice of medicine passed into the hands of monks. They would not permit any surgical operations which resulted in the loss of blood so all surgical procedures went under the maxim, "Ecclesia abhorret a sanguine." As a result of this attitude cystotomy fell into almost universal disuse. Stone solvents became the vogue. Avicenna in the 10th century advocated a very complicated mixture:

Calcined glass
Ashes of scorpions
Ashes of hare
Ashes of egg shells
Stones found in a sponge
Powdered goat's blood
Lapidis judaici
Parsley
Wild carrots
Marshmallow seeds
Gum Arabic

Make into an electurary with honey.

This is a typical example of the hundreds of preparations that were being prescribed at the time.

Some time later a group of practitioners known as the barber surgeons developed. These men were restricted in their activities to such operations as blood-letting, removal of corns and other harmless practices.

In the meantime the wretched sufferers from stone were condemned to everlasting misery, receiving lithontriptics, saxifrages and divine blessings until relieved by death.

It was not until the beginning of the 16th century that science received a new impetus when a group of lay professors known as University Doctors began to revive the practice of surgery.

In 1561, a French surgeon named Piérre Franco performed the first operation of suprapubic lithotomy in a boy of 10. He described his experience as follows:

> "The stone was as large as a hen's egg and resisted all my efforts to extract it by way of the perineum. The parents and friends were greatly demoralized by the suffering to which I was subjecting their child and maintained that they would rather have him die than be subjected to such awful suffering; being influenced by the thought that I could not have it charged against me that I was not able to extract the calculus I deliberately decided that I would make an opening above the pubic bone and deliver it in this manner. Accordingly I incised the skin above the pubes through the soft tissues down to the calculus which I had simultaneously pushed upwards by pressure against the perineum. My assistant created counter pressure against the stone by firmly compressing the abdominal wall above the object. The operation was a complete success."

Franco was appalled by what he had done because he had violated the then established Hippocratic belief that all bladder wounds were fatal. He felt that his success was due to sheer good fortune and he strongly recommended surgeons never to try this method. He himself never tried it again.

Twenty years later Rossetus demonstrated the practicability of the suprapubic operation by his experiments on the cadaver, but he never performed it on a living person.

Because of the Hippacratic dictum and Franco's pessimism no one attempted the high operation for the next 150 years. Early in the 18th century, an Englishman, John Douglas, distinguished surgeon of the Westminster Hospital, London, revived this procedure and established it on a firm footing.

Cheselden recorded in his book the manner in which this operation was established in Paris. It was known that a French archer of Mudon who was condemned to die for robbery was afflicted with stone. A group of Parisian surgeons, eager to experiment, obtained permission from the King and government to do a suprapubic lithotomy on this man. It was agreed that should he recover he would be pardoned and rewarded by the school for his sufferings. The criminal was successfully operated upon, was pardoned and received the reward.

For an unkown number of years preceding the 17th century it had been a well established custom for members of the medical profession in France and the neighboring countries, as the Hippocratic oath enjoined, to entrust all cases of stone to expert lithotomists. This gave rise to a group of itinerant lithotomists, medical people and otherwise, who made it their business to travel from town to town and operate for stone. They guarded their secret carefully and very few people became acknowledged as experts.

One such person, a monk, named Frére Jaques, learned the art from an Italian physician named Paulony. Jaques is credited with having invented the operation of lateral lithotomy. His method consisted in introducing a long-rounded staff into the urethra, then thrusting a knife into the ischiorectal fossa 3 fingers breadth to one side of the mid line; the base of the bladder was thus penetrated. His success by this method was mainly in large stones.

Jaques' reception by the medical profession in Paris was of the coolest description. One critic, commenting upon his air of sanctity and claim to be a monk, "fails to understand how, if he be a monk, his superiors can allow him to roam the Kingdom and cut persons of both sexes for stone; which he cannot do without viewing the objects which must put that chastity of which he has made a vow, to a very severe test."

In 1697 when Frére Jaques visited Paris he had already attained wide celebrity as a lithotomist. But the surgeons of that city were not at all pleased that an itinerant lithotomist from the provinces should have the opportunity to request permission from the authorities to exhibit his method before the medical faculty of Paris. His request, however, was granted and he performed the operation upon a man of 40 at Hotel Dieu, in the presence of a large assembly of physicians. The patient made a good recovery.

At Fontainbleu he operated upon a shoemaker's boy, aged 14. The patient was cured in three weeks and Jaques' success was assured. The magistrates then appointed John Mery, an accomplished surgeon and anatomist, to examine Jaques and to decide upon his ability to do this type of surgery. Mery watched Jaques operate upon a cadaver and afterwards dissected the body. He found that the incision had been made into the bladder through the prostate gland. Mery was highly impressed and gave a favorable report to the magistrates. Jaques was then permitted to operate at Hotel Dieu.

Of his first twelve cases three died and nine made a good recovery. He then performed sixty cases in public. So great was the crowd that soldiers had to be employed to keep back the press of people. Dr. Lister of London who saw him perform stated that Jaques could do ten cases in less than an hour. Lister also remarked, "He

put me in some disorder at the cruelty of the operation, however I visited all the patients in their beds and found them more amazed than in pain."

Boerhaave, in his book, recorded that in 1703, a French nobleman, afflicted with stone, before he would submit to be operated upon by Frére Jaques received into his palace twenty-two persons afflicted with the same disorder. Jaques operated upon them and they all recovered. After so many favorable experiments, the nobleman considered it a safe procedure, so he submitted to operation and promptly died. Jaques' luck in Paris was not maintained. It would appear that his failures were mainly amongst the socially prominent and his successes amongst the poor.

He was next heard of in Holland, where he worked with Rau. Rau learned all that Jaques had to impart, then proceeded to improve the operation. Rau failed to credit Jaques with what he had done. The magistrates of Amsterdam presented Jaques with his portrait and a set of gold sounds which he subsequently melted down and sold, giving the proceeds to the poor. Jaques died at the age of 69 and is said to have operated upon six thousand patients for stone.

In connection with the operation of lithotomy, the diary of the famous Samuel Pepys gives an idea of the relief obtained from a successful operation. The following is an extract:

"March 26, 1660

This day it is two years since it pleased God that I was cut for the stone at Mrs. Turner's in Salisbury court and did resolve while I live to keep it a festival as I did last year at my house and forever to have Mrs. Turner and her company with me. But now it pleased God that I am prevented to do it openly. Only within my soul I can and do rejoice and bless God, being at this time, blessed be his holy name, in good health as ever I was in my life.

March 26, 1661

This is my great day and three years ago I was cut of the stone and blessed be God, I do find myself very free from pain again.

March 26, 1662

Up early, this being by God's great blessing the 4th solemn day of my cutting for this stone, this day 4 years and am by God's mercy in good health and like to do well, the Lord's name be praised for it.

March 26, 1665

This is the day 7 years which by the blessing of God I have survived my being cut of the stone and now in very perfect health and have long been. And though the last winter as severe as many have been these many years, yet I never was better in my life . . . now I am at a loss to know whether it be my hare's foot which is my preservative, for I never had a fit of colic since I wore it, or whether it be taking of a pill of turpentine every morning."

It would appear that very little attention was paid to stone in the kidneys or ureter, until in 1633, Dominico Marchetti, a bold and versatile surgeon from Padua, Italy, successfully operated for renal calculus.

Under the heading of Prognostics, Ambroise Paré gave an interesting account of what happens when one or both ureters are blocked—

"When the stone is cast forth of the kidney and is driven into one of the ureters that it wholly stop it, yet thereupon there followeth no suppression of the urine for seeing that nature hath made divers parts of an body double, all the urine floweth into the other ureter; but if they should be both stopped with stones, there is no doubt but the urine will be wholly suppressed and death ensues by the suffocation and extinction of the native heat by the urine flowing back by the rivelets of the veins over all the whole body."

As late as 1796 Benjamin Bell of Edinburgh gave a very gloomy prognosis for operation on the kidney—

"Upon the whole we may conclude, that when not directed by the appearance of a tumor to the part that ought to be opened, the uncertainty of the ground upon which we proceed when we undertake this operation, the difficulty of performing it and the very imminent danger that attends it will more than counterbalance any advantage that can ever probably be derived from it. So that the operation of nephrotomy will never probably be received into general practice."

For a time during the 18th century there seemed to be a reversion to non-surgical methods in the form of dissolvements. A certain Mrs. Joanna Stephens claimed absolute and positive cures for her secret method which was advertised as painless and harmless. The lady acquired such a reputation that in 1739 the English parliament purchased her secret for £5,000 and the French government decorated her with a medal of honor and awarded her the sum of 60,000 francs. The document obtained follows—

"My medicines are a powder, a decoction and pills.

"The powder consists of egg shells and snails, both calcined.

"The decoction consists of boiling some herbs together with a ball which consists of soap, swine's cresses burned to blackness, and honey in water.

"The pills consist of snails calcined, wild carrot seeds, burdock seeds, ashen keyes, hips and hawes, all burned to blackness, also soap and honey.

"Give one dram of the powder mixed in cyder, followed by a half pint of the decoction three times daily. If the decoction disagrees with the stomach the pills should be substituted."

Enthusiasm over this method of treatment became so great that for a time lithotomy was barred. Whenever mucus was found in the urine it was interpreted as dissolved stone. Soon it was discovered that the sure cure was nothing but a chimera. Four persons who had been certified as cures by trustees appointed by the government died, and autopsy in each case revealed stone in the bladder. A post mortem follow up on every other supposedly successful case revealed stone.

Soap and lime water appears to have been a favorite dissolvement. Instillation of solution into the bladder was also practised.

Next we come upon the era of litholopaxy or blind crushing of stones in the bladder. In 1626 Sanctorius devised a crude instrument for crushing of stones without opening the bladder but it was not until the time of Civale in the early part of the 19th century that the procedure could be performed with a reasonable degree of safety. His instrument consisted of two metal tubes, the inner one having three curved projections by which the stone was grasped and held while a sharp iron rod was used to bore a hole in it. Weiss invented a curved screw lithotrite in 1824 and Heurteloup designed a curved percussion lithotrite in 1833. It was not until Bigelow in 1878 perfected the lithotrite that the modern operation of blind litholopaxy became standardized. In recent years the introduction of the cystoscopic visualizing lithotrite has replaced the blind method in the case of smaller vesical calculi.

And now we come to the late modern era, that is, the 19th and 20th centuries. The innovation of ingenious instruments for stone extraction has completely revolutionized surgical treatment for stone. Recent work on calculogenesis and urinary infections has made certain prophylactic measures possible despite our ignorance as to the cause of stone formation. Statistics indicate a marked shift in the age of distribution of bladder stone. At present only 11% of patients with bladder stone are under 30 years of age, a century ago 83% were included in this group. The striking change is apparently due to dietetic improvement and a more thorough understanding of vitamin requirements.

With all our advances we are still groping in darkness. There are almost as many theories of stone formation as there are authorities. In this hyper-prophylactic age we are still at a loss to know how to prevent its formation or recurrence after it has been removed. Those who are critical of the crude methods of our ancestors ought to bear in mind that our own knowledge is still very inadequate. The ultimate solution of this complicated problem shall be a distinct advance to medical science.

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